

# COLON PERFORATION: A RARE COMPLICATION DURING PERCUTANEOUS NEPHROLITHOTOMY

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Only a few cases of colon perforation during percutaneous nephrolithotomy (PCNL) have been reported. We present here a case of colon perforation during PCNL that was managed conservatively by stenting the urinary tract, using the percutaneous catheter as the colostomy tube, and giving broad-spectrum antibiotics. This report also reviews the anatomic and technical access to the kidney and reminds the urologist about this rare but serious complication of PCNL.

**Key Words:** colon perforation, percutaneous nephrolithotomy  
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Percutaneous nephrolithotomy (PCNL) has been an established treatment modality for more than 20 years and has replaced open surgery for the removal of large renal stones. This technique is generally used for the treatment of stones resistant to extracorporeal shock wave lithotripsy (ESWL), lower-pole stones, calyceal diverticulum stones, and staghorn stones or larger renal stones [1]. Although PCNL is associated with lower morbidity and shorter hospitalization than open surgery, it is not free from complications. Generally, the risks of PCNL increase with the size of the stone, because operating time increases; in addition, fragmenting a large stone into removable fragments also increases the chance of some damage to the kidney. Bleeding and infection are the most commonly reported complications [2]. However, bowel injury is an extremely rare but serious complication during PCNL. Here, we report a case of colon perforation during PCNL and discuss the management of this condition.

## CASE PRESENTATION

A 67-year-old man presented with multiple stones of the lower pole of the left kidney (Figure 1), leading to recurrent urinary tract infection. Physical examination revealed that the patient had edema of the lower leg. He then received ESWL treatment for a left renal stone. However, poor fragmentation of the renal stone was discovered after 2 weeks at follow-up. Two months later, he underwent left PCNL with access through the lower calyx puncture of the left kidney just lateral to the paraspinal muscles under guidance of C-arm fluoroscopy provided by an experienced radiologist. The patient underwent the operation in the prone position, and the total operative time was about 60 minutes. A ureteral stent was antegradely placed during the PCNL procedure.

On the second postoperative day, a plain radiograph was taken to look for any residual stone, and a pyelogram, performed through the nephrostomy catheter, was considered normal, except for a small residual renal stone. However, the patient complained of pain in the puncture site, had fever of 37.6°C (99.7°F), and had a purulent discharge around the nephrostomy catheter. On postoperative day 4, the amount of urine from the

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nephrostomy tube decreased and another pyelogram was performed. It showed contrast in the descending colon, and the diagnosis of colon perforation was made (Figure 2). Broad-spectrum antibiotics were administered, and the nephrostomy tube was left in the descending colon as a colostomy tube. Culture of the discharge identified combined infection with *Pseudomonas aeruginosa* and *Klebsiella pneumoniae*. Computed tomography (CT) scans on postoperative day 8 showed a retrorenal colon and ureteral stent in the left ureter (Figure 3). Under conservative management, the patient's condition stabilized. Another abdominal CT scan was performed to confirm the healing of the colon-renal fistula, and the patient was discharged on postoperative day 14 after the colostomy tube was removed. The ureteral stent was removed 2 months after surgery, and convalescence was uneventful.



**Figure 1.** Plain radiograph of the abdomen revealed large lower calyceal stones.

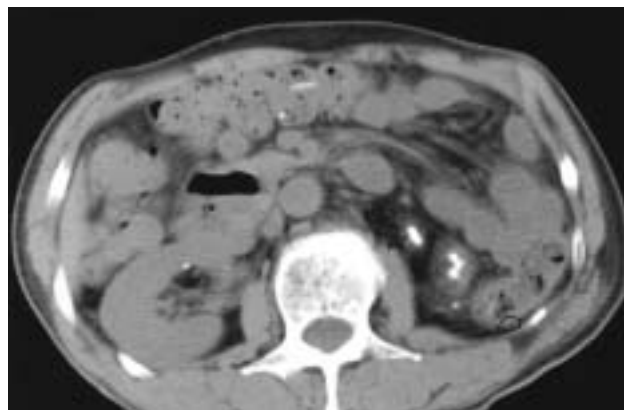
## DISCUSSION

In 1955, Goodwin and his associates first introduced the technique of percutaneous nephrostomy, a tract meant for drainage of pus and urine [3]. Fernstrom and Johansson further utilized this technique for removing stones in the late 1970s [4]. Although ESWL has replaced PCNL, much as the latter replaced open nephrolithotomy, PCNL still has a place in clinical practice. Indications for PCNL include large renal stones, complete or partial staghorn stone, stones refractory to ESWL, and renal malformations such as infundibular stenosis or ureteropelvic junction stenosis [5].

The morbidity associated with PCNL is highly dependent on stone burden. Lee et al reviewed a series of 500 patients who underwent PCNL; the most common complications were bleeding, with 12% of the patients requiring transfusion [6]. Other complications include infection (0.6%), retained



**Figure 2.** Antegrade pyelography 4 days after percutaneous nephrolithotomy showed the nephrostomy tube and the contrast medium in the descending colon.



**Figure 3.** Computed tomography scan shows a retrorenal left colon (arrow) and the ureteral stent in the left ureter (arrowhead).

stone fragments (4%), and ureteropelvic junction stricture (1%). The transfusion rate tends to increase with larger stone burden and use of multiple access tracts. The recommendation for patients with serious postoperative bleeding is angiography and embolization of peripheral vessels.

Although any organ adjacent to the kidney may be injured during the PCNL procedure, complications are rare. Perforation of the colon occurs in less than 1% of cases [7] and, thus, patients are not routinely given a preoperative bowel preparation. Possible risk factors for colon perforation include an extremely lateral percutaneous nephrostomy tract, an associated colon obstruction, a hypermobile kidney, and a retrorenally positioned colon. These anatomic abnormalities cannot be visualized by intravenous urography or preoperative sonography, both of which were most commonly used to evaluate patients before PCNL became available. Posterolaterally and retrorenally positioned colon has been reported in 1% of the normal population after reviewing a series of 200 cases on CT scan [8]. Magnetic resonance (MR) imaging and CT may display a cross-sectional anatomic region and facilitate the identification of adjacent structures. However, the low incidence of this complication does not justify the routine use of CT scanning. Only a select group of patients require CT- or MR-guided percutaneous access to perform PCNL. This group includes patients with ectopic kidney, a retrorenal colon, any form of megacolon, splenomegaly and hepatomegaly [9]. In our case, the descending colon was located at the posterior part of the kidney, which may increase the risk of colon perforation.

The perforation of the colon was probably not noticed during the procedure. The clinical presentation of a patient with a renoalimentary fistula is variable. In a few cases, the presence of fecaluria, pneumaturia, or biliuria may be noted. Evidence of sepsis with fever and leukocytosis is uncommon. Extraperitoneal colon injury can be managed conservatively by stenting the urinary system and using the percutaneous tube as a colostomy tube. A nasogastric tube should be left in the stomach to prevent stressing the anastomotic suture lines in the immediate postoperative period. When the connection between the urinary and fecal tracts has sealed, the tube can be removed. The cutaneous fistula tract will close shortly thereafter. Intraperitoneal perforation of the

colon may require open exploration and repair. Duodenal injury has also been reported with PCNL and was successfully managed conservatively. In our patient, stenting the ureter with a double-pigtail stent, pushing the percutaneous tube into the descending colon as a colostomy tube, and giving broad-spectrum antibiotics constituted adequate management.

## CONCLUSIONS

Despite the rarity of colon perforation during PCNL, every urologist should be aware of the risk of an aberrant retrorenal colon loop. Abdominal symptoms and the presence of fecaluria and/or pneumaturia should alert the clinician to the possibility of colon perforation. Most such complications can be managed conservatively without open exploration.

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# 大腸穿刺傷 — 經皮腎造瘻取石術 的罕見併發症

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目前只有少數幾例的文獻報告關於經皮腎造瘻取石術所造成的大腸穿刺傷。我們在此提出一例在經皮腎造瘻取石手術時，造成大腸穿刺傷的個案，並在併發症發生後，以輸尿管內管引流尿液，以經皮腎造瘻管作為大腸造瘻管，以及投與廣效抗生素等保守療法而治療成功的案例。本文並回顧經皮腎造瘻時，腎臟的相關構造位置以及經皮腎造瘻手術的技巧，並提醒泌尿科醫師這個罕見但嚴重的併發症。

**關鍵詞：**大腸穿刺傷，經皮腎造瘻取石術  
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